

ANNOTATIONES ZOOLOGICAE JAPONENSES

Volume 42, No. 4—December 1969

Published by the Zoological Society of Japan
Zoological Institute, Tokyo University

Report on Freshwater Planaria from India

With 2 Text-figures

Masaharu KAWAKATSU

Biological Laboratory, Fuji Women's College, Sapporo

(Communicated by M. UÉNO)

ABSTRACT A new species of the genus *Dugesia* (Turbellaria, Tricladida, Paludicola): *Dugesia indica* n. sp., from India is established in the present paper. This new species differs from the closely related Burmese species, *Dugesia burmaensis* (Kaburaki, 1918), in the details of the genital anatomy.

The material on which the present article is based was presented to me by Mr. M. Chaudhury of Jabalpur, Madhya Pradesh, India, who requested the identification of this species of Indian freshwater planarian. He also provided me with a sketch of the head of the living worm and with fifteen preserved specimens collected in the vicinity of Jabalpur (Jubbulpore). They were fixed in Bouin's fluid (7 specimens; Kawakatsu's Specimen Lot No. 351 group) and in saturated sublimate solution (8 specimens; Kawakatsu's Specimen Lot No. 352 group). I have made a whole mount of a well extended specimen (No. 352 h) as well as fourteen sets of serial sections (No. 351 a-g; No. 352 a-g). Only one specimen (No. 352 d) proved to be of a sexually mature state. This Indian triclad belongs to an undescribed species of the genus *Dugesia* of the family Planariidae, the description of which will be given below and which is new to science.

Order TRICLADIDA

Suborder PALUDICOLA or PROBURSALIA

Family PLANARIIDAE

Genus *Dugesia* Girard, 1850

Dugesia indica Kawakatsu, new species

Description The species is rather small and pigmented. Its appearance in the preserved condition is shown in Figure 1 (A). The sexually mature worm is 8 mm in body length and about 1 mm in width. The head is triangular in shape, with low, blunt but prominent auricles; no distinct narrowing ("neck") occurs behind the head. The body remains about the same width to the region of the genital apparatus and terminates in the bluntly pointed posterior end.

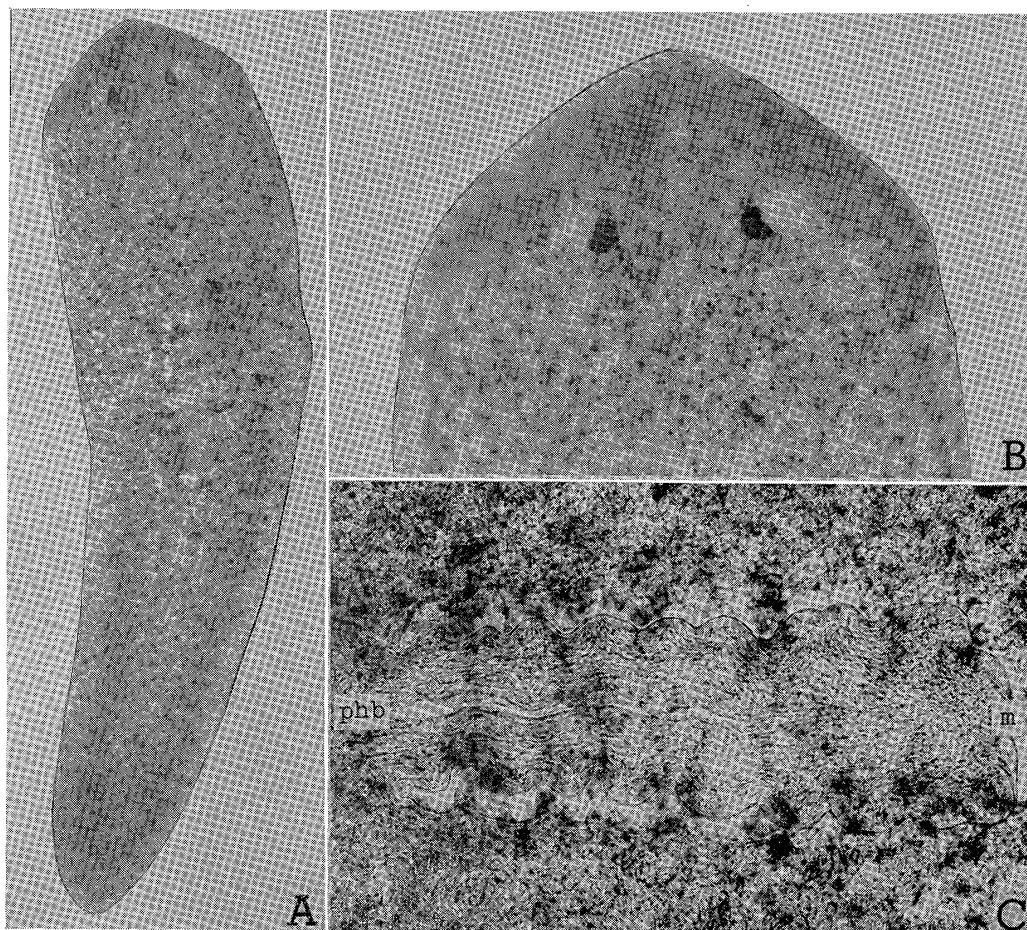


Fig. 1. *Dugesia indica* n. sp. from Jabalpur in India. A, photograph of a preserved asexual specimen (Specimen No. 352 h, whole mount). B and C, highly magnified photographs of a preserved specimen taken from the whole mount (Specimen No. 352 h). B, head; C, pharynx. Phb, pharyngeal base; m, mouth.

The general color of the body is cloudy brown on the dorsal surface and light greyish brown on the ventral side. Numerous dark brown to black pigments or small granules are seen on the dorsal side, as shown in Figure 1 (A and B).

Two eyes are situated on the dorsal side of the head; the distance between them is about one-third the width of the head at the level of eyes. A white colorless area is invariably present around each eye (Fig. 1B).

The pharynx is situated at about the middle of the body and is nearly one-sixth as long as the body. It is of interest that weak constrictions of the pharynx are seen in some of the specimens examined (Fig. 1C). In histological structure the pharynx is typical of the family Planariidae; the inner musculature consists of two layers, a thick circular layer adjacent to the epithelium of the pharynx lumen and a rather thick layer of longitudinal fibres. The anterior intestinal trunk bears 8 or 9 branches on each side. Each posterior trunk has 10 to 12 lateral branches and about as many shorter inner ones.

The dorsal epithelium is thicker than the ventral and is provided with rhabdites. A marginal adhesive zone is apparent. There are no other general histological characters that have a taxonomic significance.

Two ovaries are large in size, each situated in the ventral space between the second and the third intestinal diverticula. Two ovovitelline ducts converge at the level of the copulatory apparatus and open separately into the distal part of the bursal canal (Fig. 2). Numerous yolk glands (or vitellaria) are distributed posteriorly from the region of the ovaries nearly to the posterior end of the body.

The testes are numerous, of small size, and occupy the dorsal half of the mesenchyme. They are arranged on each side of the midline in a single longitudinal zone extending from the posterior level of the ovaries to the posterior end of the body. Two sperm ducts form the usual spermiducal vesicles on either side of the pharynx and the copulatory bursa. On the side of the penis bulb each narrows to a slender duct and entering the penis bulb from the antero-lateral sides opens into the bulbar cavity separately (Fig. 2).

A sagittal view of the copulatory apparatus of the Jabalpur specimen is shown in Figure 2. The genital pore, which is situated in the midline posterior to the pharynx and at a point about one-third of the length of the postpharyngeal region, connects with a narrow posterior extension of the common genital antrum which continues into the terminal part of the bursal canal postero-dorsally and into the male antrum anteriorly. The wall of the genital antrum is clothed with tall, glandular epithelium and is provided with muscle layers, one circular and the other lon-

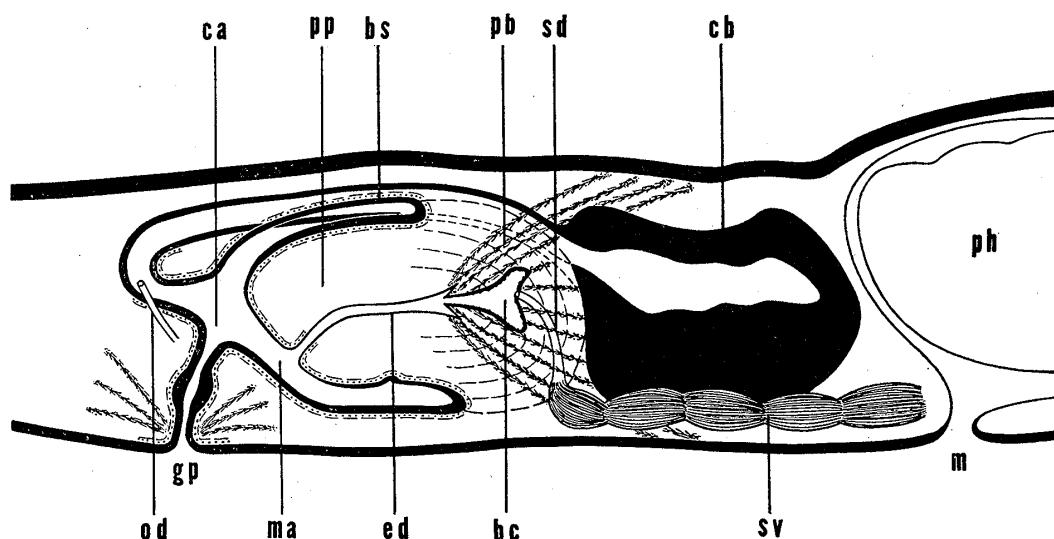


Fig. 2. Diagram showing the sagittal view of the copulatory apparatus of *Dugesia indica* n. sp. (Specimen No. 352 d, holotype). bc, bulbar cavity; bs, bursa stalk; cb, copulatory bursa; ca, common antrum; ed, ejaculatory duct; gp, genital pore; m, mouth; ma, male antrum; od, ovovitelline duct; pb, penis bulb; ph, pharynx; pp, penis papilla; sd, sperm duct; sv, spermiducal vesicle.

gitudinal. It was observed that the epithelial cells are comparatively well developed at the posterior part of the common genital antrum.

The penis has a moderately large and spherical bulb embedded in the mesenchyme and a large papilla projecting into the male antrum (Fig. 2). Both the bulb and the papilla are highly muscular. The bulbar cavity or the seminal vesicle is a rather wide cavity of a spherical shape, into which the two sperm ducts open separately. It continues to the papilla (ejaculatory duct) and opens at its ventral side near the tip. A small diaphragm separates the bulbar cavity from the narrow ejaculatory duct (Fig. 2). Both the bulbar cavity and the ejaculatory duct are lined with the usual glandular epithelium. The bulb is pierced by numerous gland ducts (penis gland) which open into the bulbar cavity. The secretion of these ducts contains eosinophilous granules.

In the specimens examined, the penis papilla appears to be of a cylindrical shape as shown in Figure 2. The papilla in this shape may be a contracted state of this organ, and its outer wall is covered with a tall, cubical epithelium similar to that lining the genital antrum. Below the epithelium there are two layers of muscle fibres, one circular and the other longitudinal.

The copulatory bursa is large and irregularly lobed, and is lined with a tall glandular epithelium. The bursa stalk, a duct of almost uniform diameter, runs posteriorly close to the midline and then curves ventrally and opens into the common genital antrum. Below the ordinary epithelium lining the bursal canal there are two layers of muscle consisting of intermingled circular and longitudinal fibres. The thick walled cavity of the distal part of the bursa stalk (vagina) was not developed in this species. From both lateral sides, the distal part of the bursa stalk receives the two ovovitelline ducts accompanied by many eosinophilous glands. Weakly eosinophilous cement glands open into the common antrum near the genital pore.

Holotype One set of sagittal serial sections of the Jabalpur specimen (Specimen No. 352 d, one slide) preserved in Kawakatsu's cabinet of Fuji Women's College in Sapporo; also 13 sets of sections (Nos. 351 a-g, 352 a-c, e-g) and one whole mount (No. 352 h) of asexual specimens.

Locality In the vicinity of Jabalpur, Madhya Pradesh, India; collected by Mr. M. Chaudhury in 1962.

Taxonomic Remarks and Differential Diagnosis The known species of the genus *Dugesia* (cf. Hyaman 1939) as well as those species which may belong to the same genus reported from the south-eastern part of the Asiatic Continent, the Far East and the North Pacific area were listed and discussed in a previous paper (cf. Ichikawa and Kawakatsu, 1964, pp. 192-193; see also, De Beauchamp, 1929; Hyman, 1934; Marcus, 1953). Since that time, a number of new data concerning the taxonomy and distribution of several Asiatic species of *Dugesia* have been obtained (cf. Kawakatsu, 1968). The distribution range of *Dugesia japonica* Ichikawa et Kawakatsu, 1964, has been thoroughly studied by my team (cf. Ichikawa and Kawakatsu, 1967; Kawakatsu, 1965, 1967; Kawakatsu and Iwaki, 1967, 1968;

Kawakatsu, Iwaki and Kim, 1967; Kawakatsu and Kim, 1966, 1967; Kawakatsu, Morita and Iwaki, 1967). As far as our present knowledge goes, this species has been recorded from the following countries: Japan, Okinawa (the Loochoo Islands), Taiwan (Formosa), South Korea and the north-eastern part of China. The two species, *Dugesia bactriana* De Beauchamp, 1959 and *Dugesia lindbergi* De Beauchamp, 1959, both of which were described from Afghanistan (cf. De Beauchamp, 1959, 1961, 1963), were also recorded from the northern part of West Pakistan (Kawakatsu, MS). Several undescribed species of *Dugesia* were collected in Nepal, the Malay Peninsula, Borneo and Java (Kawakatsu's unpublished data). In addition to the Asiatic species of *Dugesia* listed in my previous paper (op. cit.), *Dugesia* sp. (*olim Planaria aborensis*) (Whitehouse, 1913), from the southern part of the Abor district, Assam in India, the name of which was omitted from the list, must be mentioned.

Among the known Southeast Asiatic species of the genus *Dugesia*, the following five species have asymmetric penis papillae and no adenodactyls in the copulatory apparatus. They are: *Dugesia japonica* Ichikawa et Kawakatsu, 1964, from the Far East including the Japanese Islands, *Dugesia* (*olim Planaria*) *burmaensis* (Kaburaki, 1918) from Burma (muddy bottom 12 feet in depth in Inlé Lake), *Dugesia* (*olim Planaria*) *andamanensis* (Kaburaki, 1925) from Ross Island in the Andaman Islands, *Dugesia lindbergi* De Beauchamp, 1959, from Afghanistan and West Pakistan, and *Dugesia hymanae* (*olim Planaria hymani*) (Sivickis, 1928) from the Philippine Islands.* These species strikingly resemble the present new species not only in external appearance but also in the anatomy of the reproductive system. There is, however, the essential difference in the genital anatomy except for one species, *Dugesia burmaensis*. Undoubtedly, both the present new species and *Dugesia burmaensis* are near relatives, but in the latter the sperm ducts open into the posterior narrow part of the bulbar cavity (cf. Kaburaki, 1918, Pl. XXVII, Figs. 4 and 5). According to the original description of *Dugesia burmaensis*, it shows a uniform light greyish-olive color and the complete absence of rhabdites both in the epidermis and the parenchyme (cf. Kaburaki, 1918, pp. 187-188 and Pl. XXVII, Fig. 1). Moreover, the present new species differs from *Dugesia burmaensis* in the muscularity of the bursa stalk.

There are three species, which may belong to the genus *Dugesia*, recorded from India as well as its neighbouring countries. They are: *Dugesia* sp. (*olim Planaria aborensis*) (Whitehouse, 1913) from Assam; *Dugesia* sp. (*olim Euplanaria*) (Hyman, 1934) from Srinagar in Kashmir; *Dugesia* sp. (*olim Planaria bilineata*) (Kaburaki, 1918) from Inlé Lake in Burma. However, the anatomical study of the copulatory apparatus of these species has not yet been made.

The present new species differs from the other members of the genus in the

* The true taxonomic position of two Asiatic species, *Dugesia hymanae* (Sivickis, 1928) and *Dugesia* (*olim Planaria*) *annandalei* (Kaburaki, 1918), has not yet been defined (cf. De Beauchamp 1951, pp. 95-96; Ichikawa and Kawakatsu, 1964, p. 192; Kawakatsu, 1969 a and b; Kenk, 1930, p. 292; Marcus, 1953, p. 20; Weiss, 1910, p. 544).

following characters: animals small and colored with numerous, distinct pigment granules on the dorsal surface; head triangular with low blunt auricles; two eyes; dorsal testes lie almost in a single row on each side and extend throughout the body length; penis bulb large, spherical in shape and muscular with a rather wide cavity, into which sperm ducts enter without previous union; asymmetric penis papilla large; separation of the bulbar cavity and ejaculatory duct by a diaphragm and external opening of the ejaculatory duct on the under side of the penis; copulatory bursa large, with a rather narrow bursal canal which opens into the common genital antrum; ovovitelline ducts enter the distal part of the bursa stalk separately.

ACKNOWLEDGEMENT

I am grateful to Mr. Madan Chaudhury for providing me with this material and also the following scientists for their kind help and some pertinent literature: the late Professor Ernst Marcus of São Paulo, Professor Tor G. Karling of Stockholm, Professor Anders G. Dahm of Göteborg, the late Dr. Libbie H. Hyman of New York, Dr. Roman Kenk of Washington, Professor Marie M. Jenkins of Harrisonburg, and Professor Minoru Hirano of Kyôto. I am also grateful to Professor Masuzô Uéno of Toyonaka for his unfailing interest.

REFERENCES

- Beauchamp, P. De, 1929. *Treubia*, **10**, 405.
 ——— 1951. *Rev. Zool. Bot. Afr.*, **45** (1-2), 90.
 ——— 1959. *Kungl. Fysiogr. Sällsk. Lund Förhandl.*, **29**, 27.
 ——— 1961. *Ibid.*, **31**, 77.
 ——— 1963. *Ibid.*, **33**, 45.
 Girard, Ch., 1850. *Proc. Boston Soc. Nat. Hist.*, **3**, 264.
 Hyman, L. H., 1934. *Mem. Connect. Acad.*, **10**, 5.
 ——— 1939. *Trans. Amer. Microsc. Soc.*, **59**, 264.
 Ichikawa, A. and M. Kawakatsu, 1964. *Annot. Zool. Japon.*, **37**, 185.
 ——— and ——— 1967. *Nature and Life in Southeast Asia*, **V**, 175.
 Kaburaki, T., 1918. *Rec. Ind. Mus.*, **14**, 187.
 ——— 1925. *Ibid.*, **27**, 29.
 Kawakatsu, M., 1965. *Hydrobiologia*, **26**, 349.
 ——— 1967. *Bull. Fuji Women's Coll.*, No. 5, 117.
 ——— 1968. *Jap. Soc. Syst. Zool. Circular*, Nos. 38-41, 11.
 ——— 1969a. *Bull. Osaka Mus. Nat. Hist.*, No. 22, 1.
 ——— 1969b. *Res. Bull. Meguro Parasitol. Mus.*, No. 3.
 ——— and S. Iwaki, 1967. *Bull. Fuji Women's Coll.*, No. 5, 179.
 ——— and ——— 1968. *Ibid.*, No. 6, 129.
 ———, ——— and Wun-Jai, Kim, 1967. *Zool. Mag. (Tokyo)*, **76**, 187.
 ——— and Wun-Jai, Kim, 1966. *Ibid.*, **75**, 103.
 ——— and ——— 1967. *Bull. Nat. Sci. Mus. Tokyo*, **10** (3), 247.
 ———, S. I. Morita and S. Iwaki, 1967. *Bull. Fuji Women's Coll.*, No. 5, 187.
 Kenk, R., 1930. *Zool. Anz.*, **89**, 145, 289.
 Marcus, E., 1953. "Turbellaria Tricladida". *Explor. Parc. Nat. Upemba*, Fasc. 21. Bruxelles.
 Sivickis, P. B., 1928. *Trans. Amer. Microsc. Soc.*, **47**, 356.
 Weiss, A., 1910. *Zeitschr. Wiss. Zool.*, **89**, 308.
 Whitehouse, R. H., 1913. *Rec. Ind. Mus.*, **8**, 317.